Ohio Agricultural Experiment Station.

BULLETIN 115.

WOOSTER, OHIO, JANUARY, 1900.

SUGAR BEETS AND SORGHUM.

INVESTIGATIONS IN 1899.

The Bulletins of this Station are sent free to all residents of the State who request them. All correspondence should be addressed to

EXPERIMENT STATION, WOOSTER, OHIO.

COLUMBUS, OHIO
FRED J. HEER, STATE PRINTER
1900

ORGANIZATION OF THE

OHIO AGRICULTURAL EXPERIMENT STATION.

BOARD OF CONTROL.

R. H. WARDER	North Bend
J. T. ROBINSON	Rockaway
HON. L. M. STRONG	Kenton
THE GOVERNOR OF THE STATE THE DIRECTOR OF THE STATION	*Ex officio*

OFFICERS OF THE BOARD.

J. T. ROBINSON	President
R. H. WARDER	Secretary
PERCY A. HINMAN	Treasurer

STATION STAFF.

CHARLES E. THORNE	Wooster	Director
WILLIAM J. GREEN	"	Horticulturist and Vice-Director
J. FREMONT HICKMAN, M. A. S.	"	Agriculturist
FRANCIS M. WEBSTER, M. S.	"	Entomologist
AUGUSTINE D. SELBY, B. Sc.	"	Botanist and Chemist
PERCY A. HINMAN	"	Bursar
JOHN W. AMES, B. Sc.	"	Assistant Chemist
JOHN F. HICKS	"	Assistant Botanist
WILMON NEWELL, M. Sc.	"	Assistant Entomologist
WILLIAM HOLMES	"	Foreman of Farm
CHARLES A. PATTON	"	Ass't Foreman and Meteorologist
ANNIE B. AYRES	"	Mailing Clerk
CARY WELTY	"	Mechanic
EDWARD MOHN	Strongsville	Supt. Northeastern Sub-Station
LEWIS SCHULTZ	Neapolis	Supt. Northwestern Sub-Station

The Bulletins of this Station are issued at irregular intervals. They are paged consecutively, and an index is included with the Annual Report, which constitutes the final number of each yearly volume.

BULLETIN

OF THE

Ohio Agricultural Experiment Station.

NUMBER 115. JANUARY, 1900.

SUGAR BEET AND SORGHUM INVESTIGATIONS IN 1899.

BY A. D. SELBY.

SUGAR BEETS.

Through the coöperation of the United States Department of Agriculture, in furnishing sugar beet seed for distribution to Ohio growers, this Station was enabled to continue the sugar beet investigations of 1897 and 1898. The results obtained in these respective seasons have been published in Bulletin 90 (1897) and in Bulletin 99 (1898). The plan of the experiments for 1899 was the same as in 1898, the same general forms being employed as in that year.

VARIETIES AND QUALITY OF SEED DISTRIBUTED.

The beet seed, about 500 pounds, was received late in March, 1899, and consisted of the following number and varieties, as recorded by the Section of Seed and Plant Introduction of the Division of Botany, U. S. Department of Agriculture:

No. 2379, "Zehringen", from Adolph Strandes, Zehringen, Germany.
No. 2868, "Klein Wanzlebener", from Dippe Bros. Quedlinburg, Germany.
No. 2884, "Mangold", from M. Knauer, Grobus, Germany.
No. 2885, "Biendorf Elite Klein-Wanzlebener" grown by Carl Braune, Biendorf, Germany.

Some seed of the crop of 1896, referred to as seed of 1897 of the original Klein Wanzlebener variety, had been contributed by the Lake Erie Beet Sugar Co., Sandusky, O., and was also used. In view of the reported failure of seed to germinate in former seasons, germination tests were made in the usual manner, by Mr. J. W. T. Duvel, Assistant Botanist. The following are the results of this test on both new and old seed: —

TABLE I—RESULTS OF GERMINATION TESTS OF SUGAR BEET SEED USED IN 1899 AND OF SOME OLD SEED.

	No. 2868—a. Klein Wanzlebener (Dippe)	No. 2868—b. Klein Wanzlebener (Dippe)	No. 2868—c. Klein Wanzlebener (Dippe)	No. 2379—Zehringen (Strandes)	No. 2884—Mangold (Knauer)	No. 2885—Biendorf Elite K. Wanz. (Braune)	Original K.Wanz. from seed of 1897	Vil.Imp. from seed of 1897
Number seed balls planted	100	100	100	100	100	100	100	100
Number sprouts at end of 7 days	129	138	146	46	21	31	42	60
" " " 9 "	149	.....	.....	59	59	86	62	82
" " " 10 "	160	160	171	80	111	171	93	93
" " " 14 "	165	178	175	86	147	203	101	97
Number of seed balls germinated at end of 14 days	83	80	75	53	73	90	56	57
Number with 400 more sprouts	5	10	13	.....	7	4	1	1
" " 3 sprouts	16	15	20	6	13	31	11	6
" " 2 sprouts	35	38	21	21	26	39	20	25
" " 1 sprout	27	17	21	26	27	16	24	25

Although made in the same manner as the seed tests of the previous year the results are less satisfactory. It was accordingly recommended that the seed of No. 2379 and the old seed of Original Klein Wanzlebener be sown at the rate of 18 pounds per acre, while the others were to be sown at the rate of 12 pounds per acre. No complaint of the quality of the seed of any particular variety is recalled. The late distribution of the seed gave no opportunity for early planting. The complaints of failure to germinate were much more numerous than for 1898. That some connection may exist between this late planting and the poor stand, is suggested in another portion of this bulletin. To the writer it does not appear that the quality of the seed is at fault.

THE SEASON'S WEATHER CONDITIONS.

The weather conditions for the growing season (May, June, July, August and September) of 1899 have not been very remarkable, save possibly, the fine weather for October, continued during much of November. The temperatures have been above the normal, except for September, as will appear from the adjoined table, compiled from the Ohio Weather Bureau Reports: —

TABLE II — SUMMARY OF OHIO WEATHER CONDITIONS FOR 1899

Month	Temperature, Degrees Fahr.				Rainfall	
	Extremes		Average Mean		Mean or Average	
	1899 Lowest	1899 Highest	1899	Normal	1899	Normal
March	10	76	36.9	38.5	4.66	3.45
April	26	94	53.3	51.1	1.61	3.19
May	328	96	63.3	60.9	4.32	3.63
June	436	102	71.5	70.3	2.96	3.52
July	541	105	74.1	73.9	4.18	3.96
August	639	104	73.7	71.2	1.82	2.91
September	26	105	64.1	65.5	2.69	2.63
October	20	74	57.4	52.5	2.14	2.08

[1] on 7th of month; [2] on 3rd; [3] on 22nd; [4] on 30th; [5] on 11th; [6] on 1st.

In so far as the weather conditions have influence upon the sugar content and purity coefficient of the beets, a favorable effect may justly be claimed for the season of 1899. (See page 185.)

RESULTS OF ANALYSES MADE IN 1899.

The sugar beet seed was sent upon request to 153 persons in 64 different counties. Samples of the beets grown were received from 73 persons in 34 counties and made a total of 131 samples analyzed at this Station. The analyses were made by Messrs. J. W. T. Duvel and Jno. W. Ames, assistants in the Departments of Botany and Chemistry, by far the larger number by Mr. Ames, the Assistant Chemist. The analyses and certain cultural data from the growers, are given in Table III, summarized in Table IV and compared with the results of previous years in TableV.

TABLE III—DETAILED RESULT OF SUGAR BEET

Laboratory Number	Name of Grower	Postoffice	County	Character of Soil	Variety
2211	Wm. Sowers	Selig	Adams.....	Sandy clay ...	Klein Wanz.
2230	Fred Steinbrenner.....	Spencerville ..	Allen.....	Yellow clay ..	Klein Wanz.
2210	D. C. Morrison.....	Ashtabula	Ashtabula..	Gravel	Mangold.
2271	C. O. " Lyon.....	"	" ..	Gravelly loam.	Zehringen.
2278	.....	"	" ..	"	Beindorf.
	Average, 3 samples.				
2254	C. W. Guy.....	Mechanicsburg	Champaign.	2nd bottom ..	.....
2259	T. E. Hunter.....	Mingo	"	Clay loam	Klein Wanz.
	Average, 2 samples.				
2253	John J. Lockhart.....	Bethel	Clermont...	Blk. swamp...	Klein Wanz.
2204	P. L. Hamman.....	Port William .	Clinton.....	Clay loam.....	Klein Wanz.
2205	"	" .	"	"	"
	Average, 2 samples.				
2248	F. M. Boring.....	Salineville	Columbiana	Sandy	Klein Wanz.
2279	J. J. Coleman.....	Clarkson	"	Blk. " loam.....	.....
2280	"	"	"	.....	.....
	Average, 3 samples.				
2244	Emery Elliott.....	Defiance	Defiance....	Sandy loam...	Klein Wanz.
2282	A. E. Trubey.....	"	"	" ...	"
2288	Albert Elliott	"	"	.....	.....
2289	A. E. Trubey.....	"	"	Sandy loam...	Klein Wanz.
	Average, 4 samples.				
2260	F. Ortner.....	Castalia	Erie.....	Blk. loam.....	Klein Wanz.
2261	"	"	"	"	Mangold.
	Average, 2 samples.				
2256	Louis P. Wolpert.....	Hayden	Franklin....	Sandy clay....	Klein Wanz.
2257	"	"	"	"	"
2285	Samuel Taylor.....	Pleasant Cor...	"	Black clay....	.....
	Average, 3 samples.				
2232	Geo. Graves.....	Fayette	Fulton.....	Blk. loam.....	Not known.
2236	D. J. Wyse.....	Archbold	"	Clay bottom..	"
2237	John Lantz.....	"	"	" ..	"
2238	D. J. Wyse.....	"	"	Black sand....	"
2239	Geo. Graves.....	Fayette	"	Gravelly loam.	"
2240	F. S. Wolcott.....	Delta	"	Yellow sand..	Klein Wanz.
2241	"	"	"	" ..	Zehringen.
2242	"	"	"	" ..	Biendorf.
2243	"	"	"	" ..	Mangold.
	Average, 9 samples.				
2197	Lucinda E. Doup.....	Chardon	Geauga.....	Sandy	Vilmorin.
2262	J. C. Childs.....	Chagrin Falls.	"	Sand and clay.	Klein Wanz.
2281	Lynn Niece	Bissell	"	Sandy loam...	"
2290	Lee Snyder.....	Burton	"	Mellow loam..	"
2291	"	"	"	" ..	"
	Average, 5 samples.				
2172	Harry Kline.....	Dayton	Greene.....	.....	Klein Wanz.
2173	Jacob Kline.....	Osborn	"	.....	Vilmorin.
2222	J. D. Mills.....	Spring Valley.	"	Clay loam.....	Klein Wanz.
2223	B. F. Rohrer.....	Osborn	"	Sandy clay....	"
2228	Joseph Schoenherr ...	Fairfield	"	Black loam....	Vilmorin.
2249	O. M. Conner.....	Jamestown ...	"	Clay loam.....	Klein Wanz.
2250	J. H. Copenheffer.....	Osborn	"	Limestone	Vilmorin.
	Average, 7 samples.				

INVESTIGATIONS IN OHIO FOR 1899 — Continued

Date of Planting	Width between Rows Inches	Date of Sampling	Date of Analysis	Average Weight of Beets ozs.	Sucrose in Beets Per cent.	Purity Coefficient	Laboratory Number
May 15	22	Nov. 3	Nov. 7	20	13.9	78.9	2211
May 15	18	Nov. 3	Nov. 15	35	16.5	90.4	2230
May 20	20	Nov. 2	Nov. 7	13	14	83.5	2210
" 26	20	" 14	" 16	24	12.5	77.2	2271
" 26	20	" 14	" 16	23	14.4	82.6	2278
				20.1	13.6	81.4	
May 20	30	Nov. 10	Nov. 14	14	12.4	74.7	2254
" 15	18	" 11	" 15	10	15.2	80	2259
				12.	13.8	77.6	
May 12	24	Nov. 13	Nov. 15	22	10.7	73.8	2253
May 1	20	Oct. 31	Nov. 7	37	10.2	70.9	2204
" 1	20	" 31	" 7	21	12.	78.8	2205
				29.	11.1	75.0	
May 11	28	Nov. 10	Nov. 14	17	15	85.9	2248
" 15	22	" 6	" 18	20	12.8	78.5	2279
" 15	22	" 6	" 18	15	10.7	75.8	2280
				17.4	12.8	80.3	
May 18	20	Nov. 6	Nov. 15	13	14.2	82.9	2244
" 18	18	" 13	" 16	18	12.9	79.5	2282
.....	.....	" 16	" 22	23	10.2	72.8	2288
May 18	18	" 13	" 22	20.8	12.2	79.0	2289
				18.7	12.4	78.8	
May 10	22	Nov. 12	Nov. 15	30	9.	69.8	2260
" 10	22	" 14	" 15	21	11.2	75.2	2261
				25.5	10.1	72.3	
April 28	20	Nov. 10	Nov. 15	6	12.9	78.6	2256
" 28	20	" 10	" 15	5	11.1	74	2257
July 2	20	" 16	" 21	15	12.8	76.7	2285
				8.7	12.3	76.4	
May 12	30	Nov. 6	Nov. 11	24	12.3	79.3	2232
" 15	30	" 8	" 11	34	13	79.2	2236
" 18	30	" 7	" 12	52	10.9	77.7	2237
" 15	30	" 8	" 11	25	12.3	78.8	2238
" 10	30	" 1	" 11	23	12.8	80.3	2239
" 10	24	Oct. 23	" 14	24	12.8	83.3	2240
" 10	24	" 23	" 14	26	11.4	78.9	2241
" 10	24	" 23	" 14	24	10.7	78.4	2242
" 10	24	" 23	" 14	22	11.5	77.5	2243
				28.6	12.0	79.2	
May 10	.....	Oct. 30	Nov. 4	33	12.9	79.1	2197
" 26	30	Nov. 11	" 15	30	11.3	76.7	2262
June 1	20	" 14	" 16	25	12.1	73.7	2281
May 7	24	" 20	" 22	13	15.2	80.8	2290
" 6	24	" 20	" 22	19	13.8	74.2	2291
				24.	13.0	78.1	
.....	.....	Sept. 16	Sept. 25	14	15.8	83.3	2172
.....	.....	" 16	" 25	13	15.2	80.4	2173
April 28	20	Nov. 6	Nov. 9	31	9.3	73.1	2222
May 28	18	" 7	" 9	46	11.1	73.4	2223
April 29	20	" 8	" 10	7	10 3	73.	2228
May 4	18	" 11	" 14	17	10.9	72.8	2249
" 18	24	" 11	" 14	22	12.	78.3	2250
				21.6	12.1	77.5	

TABLE III—DETAILED RESULTS OF SUGAR BEET

Laboratory Number	Name of Grower	Postoffice	County	Character of Soil	Variety
2186	G. W. Persing.....	Mortimer	Hancock...	.....	Klein Wanz.
2187	"	"	" ...	.....	"
2212	Geo. W. Brown.....	Benton Ridge	" ...	Clay loam.....	"
2213	"	"	" ...	"	"
	Average, 4 samples.				
2219	Wm. Manz.....	Ada	Hardin.....	Clay and loam	Klein Wanz.
2229	H. P. Owen.....	"	"	Black loam....	"
2251	Michael Long.....	"	"	Clay loam.....	.....
2252	"	"	"	"	.....
	Average, 4 samples.				
2301	C. G. Fairley.....	Bridges	Highland...	Clay loam.....	Klein Wanz.
2302	"	"	" ...	"	"
	Average, 2 samples.				
2298	O. K. Probasco.....	Paint Valley .	Holmes.....	Sandy loam...	Klein Wanz.
2258	N. B. Gunn.....	North Madison	Lake.....	Sandy	Klein Wanz.
2295	James H. Williams....	Salida	"	Blk. sand loam	Mangold.
2296	"	"	"	"	Klein Wanz.
	Average, 3 samples.				
2198	G. F. Lewis.....	East Toledo ..	Lucas.....	Blk. prairie loam	.....
2218	Miss T. J. Windler...	Raab	"	Blk. sandy l'm	Klein Wanz.
2264	G. W. Bamsey.....	Mitchaw	"	Mixed loam...	"
2265	"	"	"	" ...	"
2266	Michael Smith.....	"	"	Blk. clay.....	Zehringen.
2267	"	"	"	"	Klein Wanz.
2268	"	"	"	"	Mangold.
2269	"	"	"	"	Klein Wanz.
2270	"	"	"	"	Biendorf.
2286	L. B. Miller.....	Maumee	"	"	.....
2287	"	"	"	Blk. loam.....	.....
2292	Y. Rakestraw.....	Whitehouse ..	"	Clay and sand	Zehringen.
2293	"	" ..	"	"	Mangold.
2294	"	" ..	"	"	Klein Wanz.
2297	B. F. Gilger.....	Sta. "A," Tol..	"	Clay loam.....	Mangold.
	Average, 15 samples.				
2283	Samuel Bolander.....	Marion	Marion.....	Blk. sand.....	Klein Wanz.
2284	E. V. Baughman.....	Wadsworth ...	Medina.....	Clay loam.....	Klein Wanz.
2233	J. B. Garrison.....	Celina	Mercer.....	Blk. prairie...	Klein Wanz.
2224	Jacob Hess.....	"	"	" ...	Mangold.
2234	"	"	"	Yel. sand l'm	"
2235	"	"	"	Blk. loam.....	"
	Average, 4 samples.				
2174	John F. Mays.....	Dayton	M'ntgomery	.....	Mangold.
2181	R. R. Dickey, Jr.....	"	"	Sandy loam...	Vilmorin.
2182	"	"	"	" ...	Zehringen.
2183	"	"	"	" ...	Klein Wanz.
2184	"	"	"	" ...	Mangold.
2185	"	"	"	" ...	Biendorf.
2209	Silas W. Coble.....	Englewood ...	"	" ...	Klein Wanz.
	Average, 7 samples.				
2199	L. P. Roemer.....	Blue Rock	Muskingum	Sandy	Vilmorin.
2200	"	"	"	"	Klein Wanz.
2201	"	"	"	"	"
	Average, 3 samples.				
2263	W. W. Whitten.....	Rocky Ridge .	Ottawa.....	Black muck...	Klein Wanz.

INVESTIGATIONS IN OHIO FOR 1899 — Continued

Date of Planting	Width between Rows Inches	Date of Sampling	Date of Analysis	Average Weight of Beets ozs.	Sucrose in Beets Per cent	Purity Coefficient	Laboratory Number
June 3	.....	Oct. 5	Oct. 7	10	18.2	89.3	2186
.....	.....	" 5	" 7	8	14.2	84.7	2187
May 1	20	Nov. 6	Nov. 9	24	13.5	81.6	2212
" 2	20	" 6	" 9	21	14.0	80.8	2213
				16.1	15.0	84.5	
May 10	18	Nov. 6	Nov. 9	32	10.2	72.3	2219
" 15	30	" 1	" 16	23	13.5	81.6	2229
" 12	24	" 13	" 14	20	13.6	80.8	2251
" 12	24	" 13	" 14	22	13.	83.	2252
				24.5	12.5	79.5	
April 27	24	Nov. 2	Dec. 2	22	10.4	68.	2301
" 27	24	" 2	" 2	27	7.4	64.4	2302
				24.5	8.9	66.2	
May 12	28	Oct. 24	Nov. 25	28	14.5	77.3	2298
May 6	20	Nov. 13	Nov. 15	17	15.3	84.3	2258
" 5	24	" 23	" 25	19.3	12.3	81.8	2295
" 5	24	" 23	" 25	19.7	13.1	78.4	2296
				18.7	13.6	81.2	
.....	.....	.....	Nov. 4	19	13.3	89.35	2198
May 7	18	Nov. 6	" 9	20	12.8	91.8	2218
April 27	28	" 14	" 16	34	12.3	80.7	2264
" 27	28	" 14	" 16	36	12.1	81.9	2265
May 29	24	" 13	" 16	24	13.3	79.5	2266
" 29	24	" 12	" 16	20	14.8	83.3	2267
" 29	24	" 13	" 16	21	13.8	80.5	2268
" 29	24	" 13	" 16	19	13.4	79.2	2269
" 30	24	" 13	" 16	19	13.7	81.4	2270
" 15	36	" 19	" 21	28	11.4	78.4	2286
" 15	36	" 19	" 21	17	11.4	77.9	2287
" 15	18	" 21	" 25	20.5	12.9	80.5	2292
" 15	18	" 21	" 25	24.5	14.7	84.7	2293
" 15	18	" 21	" 25	24	13.8	82.4	2294
" 22	14	" 21	" 25	25	14	79.8	2297
				23.5	12.8	82.8	
May 12	25	Nov. 16	Nov. 21	24	12.8	82.8	2283
May 10	20	Nov. 17	Nov. 21	51	13.9	77.6	2284
May 10	18	Nov. 7	Nov. 9	10	14.	85.9	2224
" 17	.....	" 10	" 11	58	7.4	65.8	2233
" 17	24	" 10	" 11	54	12.1	77.9	2234
" 17	24	" 10	" 11	56	9.7	69.4	2235
				44.5	10.8	75.5	
.....	.....	Sept. 16	Sept. 25	21.3	14.6	80.6	2174
May 6	.....	" 28	Oct. 3	13 7	14.6	82.4	2181
" 6	.....	" 28	" 3	17.3	11.9	79.1	2182
" 6	.....	" 28	" 3	15.2	14.6	84.2	2183
" 6	.....	" 28	" 3	20.5	11.3	76.4	2184
" 6	.....	" 28	" 3	12.0	13.4	83.9	2185
April 26	24	Nov. 6	Nov. 7	32	11.5	76.5	2209
				19.0	13.1	80.7	
May 10	26	Nov. 2	Nov. 4	24	9.7	75.6	2199
" 10	24	" 2	" 4	21	8.2	72.9	2200
" 5	22	" 3	" 4	25	11.5	81.2	2201
				23.5	9.8	76.3	
May 4	18	Nov. 14	Nov. 15	19	12.3	78.3	2263

TABLE III — DETAILED RESULTS OF SUGAR BEET

Laboratory Number	Name of Grower	Postoffice	County	Character of Soil	Variety
2220	Silas Brattain.....	Paulding	Paulding...	Clay loam.....	Klein Wanz.
2221	"	"	" ...	"	Mangold.
	Average, 2 samples.				
2196	E. W. Dimock.....	Dupont	Putnam.....	Sandy	Klein Wanz.
2214	Henry Prentice.....	Teemes	Sandusky...	Clay	Klein Wanz.
2215	"	"	" ...	"	"
2216	"	"	" ...	"	Mangold.
2299	S. G. Kidman.....	Clyde	" ...	Sand	Klein Wanz.
	Average, 4 samples.				
2203	Thos. B. Hartley.....	Fostoria	Seneca.....	Blk. loam, clay sub-soil.	Klein Wanz.
2217	F. M. Frederick.....	Wilmot	Stark.....	Clay limestone	Klein Wanz.
2225	Eugene F. Cranz.....	Ira	Summit.....	Loam	Klein Wanz.
2226	"	"	"	Sandy loam...	Zehringen.
2227	"	"	"	" ...	Biendorf.
2274	R. J. Dallinga.....	Akron	"	Black loam....	Klein Wanz.
2275	"	"	"	"	Zehringen.
2276	"	"	"	"	Mangold.
2277	"	"	"	"	Biendorf.
	Average, 7 samples.				
2255	L. S. Cully.....	Willshire	Van Wert..	Clay	Klein Wanz.
2175	W. J. Green.....	Wooster	Wayne.....	Silt loam	Klein Wanz.
2176	"	"	"	"	Mangold.
2177	J. F. Hickman.....	"	"	"	"
2178	"	"	"	"	Zehringen.
2179	"	"	"	"	Biendorf.
2180	"	"	"	"	Klein Wanz.
2188	W. J. Green.....	"	"	"	Mangold.
2189	"	"	"	"	Klein Wanz.
2190	I. W. Knestrick.....	Creston	"	Blk. loam.....	"
2191	"	"	"	Yellow clay...	"
2192	J. F. Hickman.....	Wooster	"	Silt loam.....	Biendorf.
2193	"	"	"	"	Zehringen.
2194	"	"	"	"	Mangold.
2195	"	"	"	"	Klein Wanz.
2202	Robt. Eason.....	Springville ...	"	Clay & gravel	"
2206	J. K. Reynolds.....	Shreve	"	"	Biendorf.
2207	"	"	"	Clay loam.....	Klein Wanz.
2208	"	"	"	Clay gravel....	Mangold.
2231	Timothy Buckley.....	Wooster	"	Blk. loam.....	Vilmorin.
2245	Daniel Davidson.....	Smithville	"	"	Mangold.
2246	"	"	"	"	Zehringen.
2247	"	"	"	"	Klein Wanz.
2272	Jordan Bros. & Co....	Creston	"	Sand and loam	Zehringen.
2273	"	"	"	"	Klein Wanz.
	Average, 24 samples.				
2303	N. F. Fowler.....	Haney	Wood.....	Clay loam.....	.....

INVESTIGATIONS IN OHIO FOR 1899—Concluded

Date of Planting	Width between Rows Inches	Date of Sampling	Date of Analysis	Average Weight of Beets ozs.	Sucrose in Beets Per cent	Purity Coefficient	Laboratory Number
May 1	20	Nov. 6	Nov. 9	30	14.5	85.9	2220
" 1	20	" 6	" 9	29	14.	85.9	2221
				29.5	14.2	86.0	
May 4	24	Oct. 31	Nov. 4	33	14.1	88.1	2196
May 9	24	Nov. 7	Nov. 9	15	15.7	87.3	2214
" 9	24	" 7	" 9	17	14.2	82.8	2215
" 9	24	" 7	" 9	19	12.6	79.1	2216
April 22	30	Oct. 25	" 30	25	13.1	78.0	2299
				19.0	13.9	82.0	
May 10	20	Nov. 2	Nov. 7	23	14	81.7	2203
May 6	36	Nov. 2	Nov. 9	26	15.2	82	2217
May 24	24	Nov. 6	Nov. 9	9	13.4	82.	2225
" 24	24	" 6	" 9	14	12.3	77.2	2226
" 24	24	" 6	" 9	12	11.4	83.3	2227
April 28	18	" 13	" 16	15	15.2	85.6	2274
" 28	18	" 13	" 16	14	13.4	83.4	2275
" 28	18	" 13	" 16	15	12.5	83.0	2276
" 28	18	" 13	" 16	10	13.5	87.7	2277
				12.8	13.1	83.1	
May 17	30	Nov. 11	Nov. 14	28	9.2	70.8	2255
May 3	18	Sept. 25	Sept. 25	7.4	14.6	86.5	2175
" 3	18	" 25	" 25	13	12.2	78.	2176
" 13	18	.....	Oct. 3	9.9	11.9	81.1	2177
" 13	18	.....	" 3	12	13.3	85.4	2178
" 13	18	.....	" 3	14.5	12.3	84.2	2179
" 13	18	.....	" 3	7.9	13.9	85.4	2180
" 11	18	Oct. 7	" 7	15.2	10.9	80 5	2188
" 11	18	" 7	" 7	12.5	14.2	84.2	2189
.....	.....	" 23	" 26	31.7	15.1	86.4	2190
.....	.....	" 23	" 26	15.1	15.9	87.4	2191
May 10	22	" 26	" 28	9.3	13.4	83.3	2192
" 13	18	" 26	" 26	8.2	14.8	90.7	2193
" 13	18	" 26	" 26	7.5	13.7	86.2	2194
" 13	18	" 26	" 26	6.7	15.2	88.4	2195
" 12	30	" 31	Nov. 4	15	10.1	72.1	2202
" 16	34	Nov. 6	" 7	27	96.	69.2	2206
" 16	34	" 6	" 7	26	12.2	82.1	2207
" 16	34	" 6	" 7	45	11.9	75.3	2208
.....	18	.....	" 14	33	6.6	68.	2231
.....	18	.....	" 14	4	14.1	82.7	2245
.....	18	.....	" 14	5	12.4	76.6	2246
.....	18	.....	" 14	7	13.2	79.	2247
April 27	16	Nov. 15	" 16	15	13.5	86.7	2272
" 27	16	" 15	" 16	19	14.4	88.9	2273
				13.1	12.9	82.4	
May 17	18	Nov. 5	Dec. 5	36	11.7	74.1	2303

TABLE IV—SUMMARY OF TABLE III.

County.	No. of Samples	Average Weight of Beets, ozs.	Sugar (Sucrose) in Beets per cent.	Purity Coefficient
Adams	1	20.0	13.9	78.9
Allen	1	35.0	16.5	90.4
Ashtabula	3	20.1	13.6	81.4
Champaign	2	12.0	13.8	77.6
Clermont	1	22.0	10.7	73.8
Clinton	2	29.0	11.1	75.0
Columbiana	3	17.4	12.8	80.3
Defiance	4	18.7	12.4	78.8
Erie	2	25.5	10.1	72.3
Franklin	3	8.7	12.3	76.4
Fulton	9	28.6	12.0	79.2
Geauga	5	24.0	13.0	78.1
Greene	7	21.6	12.1	77.5
Hancock	4	16.1	15.0	84.5
Hardin	4	24.5	12.5	79.5
Highland	2	24.5	8.9	66.2
Holmes	1	28.0	14.5	77.3
Lake	3	18.7	13.6	81.2
Lucas	15	23.5	12.8	82.8
Marion	1	24.7	12.8	82.8
Medina	1	5.1	13.9	77.6
Mercer	4	44.5	10.8	75.5
Montgomery	7	19.0	13.1	80.7
Muskingum	3	23.5	9.8	76.3
Ottawa	1	19.0	12.3	78.3
Paulding	2	29.5	14.2	86.2
Putnam	1	33.0	14.1	88.1
Sandusky	4	19.0	13.9	82.0
Seneca	1	23.0	14.0	81.7
Stark	1	26.0	15.2	82.0
Summit	7	12.8	13.1	83.1
Van Wert	1	28.0	9.2	70.8
Wayne	24	13.1	12.9	82.4
Wood	1	36.0	11.7	74.1
Southern section	20	21.6	12.1	77.5
Middle section	18	23.5	12.0	77.8
Northern section	93	20.5	13.0	81.5
Entire state	131	21.1	12.7	80.2

TABLE V—COMPARISON OF GENERAL RESULTS FOR 1897, 1898 AND 1899

Section	Number of Samples			Average Weight Beets—Ounces			Sugar in Beets—percent.			Purity Coefficient		
	1897	1898	1899	1897	1898	1899	1897	1898	1899	1897	1898	1899
Southern section	67	51	20	31.4	18.4	21.6	12.2	10.9	12.1	75.3	76.9	77.5
Middle section	132	153	18	32.6	19.6	23.5	13.2	11.1	12.0	78.0	76.9	77.8
Northern section	355	294	93	29.2	25.0	20.5	13.6	11.6	13.0	79.4	78.7	81.5
Entire state	554	498	131	30.6	22.7	21.1	13.3	11.4	12.7	78.7	77.9	80.2

The outcome of these investigations adds to the data already secured in emphasizing the advantages of the northern section of Ohio for the successful culture of the sugar beet and for the establishment of beet sugar factories. While this is true the results in Montgomery exhibit the effects of increased care in improving the quality of the beets grown.

There is a further reduction in the average weight of the sample beets to 21.1 ounces, compared with 30.6 ounces in 1897, and 22.7 ounces in 1898. The sugar (sucrose) in the beets has increased satisfactorily, reaching an average of 12.7 percent over the entire state, and 13.0 percent in the northern section. These amounts are an average gain of 1.3 percent sugar in the beet for the state, and 1.4 percent for northern section over those of 1898, while yet slightly below the sugar percentages of 1897. The average purity coefficient, on the other hand, has increased beyond that of any previous year's investigations, being now 80.2 percent for the state and 81.5 percent for the northern section. These are decided gains over 78.7 percent for the state in 1897, and 79.4 percent for the northern section in that year, and still more above the averages in purity for 1898, which were about one percent lower than in 1897.

It is apparent that the northern section will be the chief seat of the beet sugar industry in Ohio, should it be established within our borders, as now seems probable. Already a thriving and promising industry in Michigan and New York, beet sugar manufacturing may be expected to flourish in Ohio if factories are wisely located. The conditions as to limestone and water supply have been stated in Bulletin 99. The division of the state into sections, following the Ohio weather service, has been shown on the maps of Bulletin 90, and is exhibited in the monthly weather report. Briefly stated in words: the northern section, to which attention has been directed, consists of three to four tiers of counties on the northern border, being in fact three counties deep through the middle part, and four counties deep at the east and at the west, approximately that part of the state north of 40°:45′ north latitude. The earlier analyses indicate maturity of the sugar beets the present season September 25th and October 1st. As to varieties, the Klein Wanzlebener (Dippe) appears to lead in sugar and purity, with Zehringen (Strandes) and Biendorf Elite Klein Wanzlebener alternating somewhat, in second place. The Mangold variety (Knauer), a true sugar beet, it will be observed, has led all the sorts of those included in Table VI with one grower.

TABLE VI — SHOWING COMPARISON OF SUGAR CONTENT AND PURITY OF FOUR VARIETIES OF SUGAR BEETS

	Date	No. 2379—Zehringen (Strandes)		No. 2868—Klein Wanzlebener (Dippe)		No. 2884—Mangold (Knauer)		No. 2885—Biendorf Elite Klein Wanzlebener (Braune)	
		Percent. Sucrose in Beets	Purity Coefficient	Percent. Sucrose in Beets	Purity Coefficient	Percent. Sucrose in Beets	Purity Coefficient	Percent. Sugar in Beets	Purity Coefficient
J. F. Hickman, Wooster, Wayne Co	Oct. 3	13.3	85.4	13.9	85.4	11.9	81.1	12.3	84.2
" " "	Oct. 26	14.8	90.7	15.2	88.4	13.7	86.2	13.4	83.3
R. R. Dickey, Jr., Dayton, Montomery Co	Sept. 28	11.9	79.1	14.6	84.2	11.3	76.4	13.4	83.9
F. S. Wolcott, Delta, Fulton Co	Oct. 23	11.4	78.9	12.8	83.3	11.5	77.5	10.7	78.4
Eugene F. Cranz, Ira, Summit Co	Nov. 6	12.3	77.2	13.7	82	.....	.....	11.4	83.3
Michael Smith, Mitchaw, Lucas Co	Nov. 13	13.3	79.5	14.8	83.3	13.4	79.2	13.7	81.4
R. J. Dallinga, Akron, Summit Co	Nov. 13	13.4	83.4	15.2	85.6	12.5	83.0	13.5	87.7
Y. Rakestraw, White House, Lucas Co	Nov. 21	12.9	80.5	13.8	82.4	14.7	84.7	.....	.....

ITEMS FROM THE SEASON'S REPORTS.

As to yields the reports add little, save in emphasis of moderate estimates. The effect of a poor stand is unfavorable and the growers for factories in Michigan, New York and California can testify in this line. The cost of growing in labor items, etc., was tabulated last year with great care. In this line, likewise, there is little requiring mention. Many good reports have been received, but the complete reports are fewer than in 1898, since the stand was so uneven.

Reports of insect injury have multiplied. The greater part of these mention the striped blister-beetle ("old-fashioned potato bugs") as the prime offenders. Many plots were eaten up by these insects. The broad-striped flea beetle was again active. In the Station beet plots this insect proved injurious. But by far the most serious and disheartening feature of the sugar beet experiments in 1899 has been the widespread, one might almost say, the general complaint of a poor stand of beets. In short, while the seed was known to be of good, or fairly good quality, the seedlings failed to push through and the reporters write "the seed failed to grow", "the seed did not germinate well", or "not a plant came up". While this difficulty was not absent in 1897 and was certainly conspicuous in 1898, it was paramount in 1899. A few secured fairly good stands of beets but most growers had but partial success and many complete failure. At the Station the result was a repetition of the difficulties in 1897 and 1898, only an inferior stand in any case was secured, even by replanting.

HOW CAN A BETTER STAND OF BEETS BE SECURED?

It is evident that sugar beet growing on a commercial scale must contemplate a sufficient number of beet plants on the ground before any other result of value may be expected. Indeed, as previously insisted upon, this stand should finally give beets 4 to 6 inches apart in the row, with interspaces not more than 8 inches, and rows 20 to 24 inches apart. With such a stand satisfactory results are fairly assured.

By consulting the "date of planting" column of this and the two previous bulletins upon sugar beet investigations, it will be observed that these dates are almost the same for each of the three years, being chiefly April and May, ranging from April 15th, to the end of May. Occasionally plots were seeded in March 1897, while a few were planted in June of each year. It is apparent that the solution of this difficulty can scarcely be found in planting at the same dates, or about the same dates, some other season nor by an increase of the amount of seed alone. Beets, unlike corn, wheat and oats, may not give a good stand under average conditions, except perhaps on very sandy soils where danger from packing by rain is at a minimum. In the recent seasons, those accustomed to growing onions and celery, or other plants with which a good stand

is difficult to secure, have succeeded in sugar beet growing. Prof. W. J. Green, the Station Horticulturist, has suggested that the difficulty here is essentially the same as that overcome by the onion grower who uses seed. This opinion is shared by onion growers who have been experimenting with sugar beets.

The onion growers are united in the practice of sowing the seed early to avoid the packing and baking of the soil which comes later. Sugar beet growers have apparently met the same difficulty experienced and largely overcome in the growing of onions from seed. The simple remedy of the onion grower is worthy extended trial by our sugar beet growers. *It would seem now that sugar beet seed should be planted in March or early April.* This plan is recommended, and strongly urged for the experiments of 1900. This early planting requires that the ground be plowed in fall or winter, a practice heretofore largely recommended. The seed may then be sown at the proper time in the soil which has been loosened and disintegrated by winter freezing.

Another advantage has been suggested for early planting, namely, that in the early season the growth of weeds is slow compared with their growth in late April, May and June. This should afford the young beet plants a better chance in their conflict with weeds. The danger from frost is covered by the experience of the gardeners and beet growers generally. The beet is rather a hardy plant and withstands frost better than onions do; injury will usually be limited to freezing temperatures. These considerations have led to the announcement of plans for the sugar beet work in 1900 in Press Bulletin 202, issued Nov. 27th, 1899. A seed supply has been assured for next year, and applications for beet seed solicited in time for winter plowing. By early distribution of seed it is hoped somewhat to improve the stand of sugar beets through early planting. At any rate the experiment should be tried on a great number of farms and the issue made known. The practice of raking over the beet plot or working the field with Breed's weeder, or a similar instrument, following planting, is strongly commended. When there is crusting and packing of the ground such loosening is essential.

SUMMARY.

Sugar beet experiments for Ohio have given an uneven stand of beets and rather unsatisfactory results with many growers in 1899.

It is suggested that very early planting, in March and early April, may result in a much better stand. The beets analyzed for 1899 show a satisfactory sugar percent in the beets, and a higher purity coefficient than heretofore secured in Ohio.

Attention is called to the more advantageous situation of the northern section of Ohio for the location of beet sugar factories, for which the conditions appear favorable.

SORGHUM.

Sorghum seed of five varieties in all, but chiefly of three only, was furnished to the Station by the United States Department of Agriculture, and sent in May to 122 growers in 54 counties of the State, especially to the central and southern sections. The varieties were also planted at the Station. Brief reports by letter were received from many of the growers and these indicated that seed had been largely saved for future planting, the principal aim of the distribution. The varieties distributed were chiefly Colman, Folger's Early and Early Amber, with Collier, Oomseana and Denton, in small quantities. The reports are not very definite as to Denton and Collier. Oomseana is highly spoken of, particularly for forage purposes, and some report favorably as to its syrup-making quality. This is a slender, leafy variety, apparently adapted to forage uses. Early Amber has commonly succeeded best for syrup making, because maturing earlier in this state than the Colman, which generally made a larger growth than the other sorts. The Colman receives commendation from some for syrup making and universally as forage for green feeding. Folger's Early is reported as standing up better than Colman and ripening earlier than Oomseana. One grower from Brown county thinks Colman profitable for his locality. Unfavorable report upon Early Amber is received from this county (Brown). At Jamestown, Greene county, Folger's Early ripened 15 days earlier than Colman, which was caught by frost. The yield of syrup is reported as being the same for each sort. From Terre Haute, Champaign county, Folger's Early and Colman are reported as very similar in growth and time of ripening. The sorghum grown has usually been fed to stock, including seven-months-old calves, cows, horses and hogs. A large number have also made the sorghum into syrup. A few reports are appended:

PROF. CHAS. E. THORNE,
Special Agt. U. S. Dept. of Agriculture.

DEAR SIR: — Planted Folger's Early the 15th of May on 3 rows about 400 ft. long. Seed came up well, did not grow very well at first, but later grew fast and made large stalks, from 10 ft. to 15 ft. high, and large enough to be stiff, some 1¼ inches in diameter. Commenced feeding to cows about the 15th of September. At this time about one-third of seed was ripe. About half the seed would have ripened before frost, the last of September. Seed head good size. All of stalks were fed. It made the best kind of feed, one cow would eat as much as 12 or 15 large stalks and there would not be a bit of waste. It is not a very early cane, as the name implies.

Planted Colman the 25th of May. Came up well and grew right along. Got ripe before Folger's Early, although planted ten days later; stalks very slender and the best not more than 9 feet high; part fell down badly; small head; not

near so good feed as Folger's Early; will try Colman again next year but haven't much faith in it. [Apparently Early Amber is the variety here, not Colman. A. D. S.]

Yours truly,
(Signed) JAMES MUSGROVE,
Hennings Mills,
Nov. 4th, '99. Clermont Co., O.

PROF. CHAS. E. THORNE,
Wooster, Ohio.

DEAR SIR: — I received Folger's Early and Colman sorghum seed. I wanted the sorghum to use as feed for stock, as there is no mill for making syrup in this neigborhood. I planted in rows and gave it the same attention I did corn. I could see no difference in the varieties and I am satisfied that it will be profitable feed to raise if a person wants it to feed stock.

Yours truly,
(Signed) CHAS. M. FITTS,
Nov. 3rd, 1899. Lebanon, O.

PROF. CHAS. E. THORNE,
Wooster, O.

DEAR SIR: — The sorghum seed received from you the last of May was planted at once; got a good stand. The Folger's Early ripened 15 days earlier than Colman; the Colman is too late, was caught by frost. Had syrup made of both varieties, which is of excellent quality. Could not tell any difference in quality of the two varieties. Planted seed on new ground; clay soil. Each variety yielded 15 gallons of syrup. I remain.

Yours truly,
(Signed) O. M. CONNOR,
Jamestown, O.
Nov. 3rd, 1899. Greene Co.

MR. THORNE: —

Dear Sir — The packets of sorghum seed received were planted on May 18th, '99, and cut on Oct. 1st. The varieties were Folger's Early and Colman. As for length and size of stalks, they were equal. Folger's Early stood straight and nice while the Colman lodged so bad that it was quite a task to strip it. When stripped and cut we had just two wagon-loads of it, which when taken to the mill made us 23½ gallons of syrup. The men who made it said it was the best lot they had made up this season. The sorghum seed we carefully saved, putting it in the dry before any rains came. Intend having it threshed out by a clover huller, when they hull our clover seed.

Thanking you for past favors,
I remain,
(Signed) WM. M. ROBISON,
Oct. 28th, '99. Dresden, Muskingum Co., Ohio.

MR. THORNE: —

Dear Sir: — Sorghum, Early Amber, No. 2287, planted May 20th, 1899, on clay soil well fertilized with barnyard manure; came up well and stooled freely;

green, about 8 feet tall and was very sweet, ripening about time of first frost. Plowed it four times, kept clean of weeds; yield 30 tons per acre.

Colman, No. 2309, planted and tended the same as the other variety; stalks one-half larger; ripens about two weeks later; I estimate it would yield about thirty-five tons to the acre. I fed my sorghum to my stock and consider it most excellent feed to raise for fall feeding to all kinds of stock.

Yours truly,
(Signed) C. R. WELLS,
Sidney, Shelby, Co.,
Ohio.

Oct. 29th, '99.

PROF. CHAS. E. THORNE,
Wooster, O.

DEAR SIR: — In respect to the "sorghum" seed you sent me last spring I beg leave to report as follows, and present you with labeled samples: — The seed was planted May 20th, on a very stiff June-grass sod, the soil ranging from yellow sand to clay loam, the different textures of soil running across all the rows, and while there was no manure used, the planting was next the barnyard in the corner of an old pasture field and in a good state of fertility. The rows were 3 ft. 4 in. apart, and the hills 3 ft., while the amount of ground occupied by each variety was as follows:

Early Amber and Folger's Early	1/10 acre each.
Colman	7/100 of an acre.
Denton	6/100
Oomseana	4/100

Amount of molasses of each kind:

Early Amber, No. 2286	15 gallons.
Folger's Early, No. 2293	12 "
Colman, No. 2317	11 "
Denton, No. 2349	10 "
Oomseana, No. 2360	7 "

In regard to earliness the Early Amber was first, being ready to harvest Sept. 5, while Folger's Early was 10 days behind, Sept. 15; Colman and Denton, Sept. 25; Oomseana, Oct. 1. I have the crop charged with —

Rent of land, cultivation, stripping, hauling, etc	$9 75
Manufacturing	9 90
Total	$19 65
Credit by 55 gallons of molasses at 50c	$27 50

Yours truly,
(Signed) F. S. WOLCOTT,
Oct. 17, 1899. Chestnut Ridge Farm, Delta, Fulton Co., O.

These several varieties of sorghum were planted on the Station farm but the success was not flattering. All were cut before frost and milled to obtain the sorghum juices for analysis. The following are the results of the sugar cane (sucrose) and grape sugar (glucose) determinations, as made by Mr. J. W. Ames, Assistant Chemist: —

SUGARS FOUND IN SORGHUM JUICES

Laboratory No.	Variety and Character of Seed	Sucrose before inversion (Polariscope)	Sucrose after inversion (Polariscope)	Total Sugar after inversion (Soxhlet's meth.)	Glucose (by difference)	Source of Sample
1900	Early Amber (high sugar) (No. 2286).....	7.75	8.40	14.26	6.86	O. A. E. S.
1901	Collier (No. 2331).....	9.75	9.49	13.82	4.33	"
1902	Denton (No. 2349).....	10.53	10.69	14.24	3.55	"
1903	Oomseana (No. 2359)....	.90	.30	11.40	11.37	"
1904	Colman (No. 2317).....	10.15	10.17	15.95	5.78	"
1905	Folger's Early (No. 2293).	10.85	11.40	16.89	5.49	"
1906	Early Amber (La. grown)	7.10	7.73	14.11	6.38	"
1907	Early Amber (low sugar)	8.95	9.53	15.87	6.34	"
1908	Colman (No. 2317).....	10.10	9.94	13.49	3.55	Wm. Collier, Husted, O.

Three samples of molasses, received at an early date from Mr. Wm. Collier, Husted, Clarke county, were also analyzed and gave the following results, which may be taken as representing the usual composition of sorghum syrup in our State: —

COMPOSITION OF SORGHUM SYRUPS

Lab. No.	Variety	Sucrose before inversion (Polariscope)	Sucrose after inversion (Polariscope)	Reducing sugar (glucose) direct	Source of sample
1909	Colman (No. 2317).....	44.2	43.38	21.71	Wm. Collier, Husted, O.
1910	Folger's Early (No. 2293)..	47.0	44.58	21.19	"
1911	Not stated.....	48.2	48.48	21.30	"

As earlier stated, the chief good to be secured by the distribution of sorghum seed in Ohio, is dissemination of new varieties, to show their adaption and to furnish local supplies of the seed of those sorts of greatest value. The outcome has been along these lines; doubtless a larger and better seed supply would have been saved if it had been feasible to distribute the seed somewhat earlier than was done.

PUBLICATIONS OF THE OHIO AGRICULTURAL EXPERIMENT STATION.

A complete list of previous publications of this Station may be found in Bulletin 95. Following are the titles of subsequent bulletins:

No. 96. The Army Worm and other insects; Wheat and Grass Sawflies; the Corn or Boll Worm; the Painted Hickory Borer; the Raspberry Cane Borer; the Peach Scale.
No. 97. Diseases of wheat and oats.
No. 98. Small fruits; cultural notes and comparison of varieties.
No. 99. Sugar beet investigations in 1898.
No. 100. A comparison of factory-mixed and home-mixed fertilizers.
No. 101. Experiments with oats.
No. 102. Soil and seed treatment and spray calendar for insect pests and plant diseases.
No. 103. The San José Scale in Ohio.
No. 104. Further studies upon spraying peach trees and upon diseases of the peach.
No. 105. Further studies of cucumber, melon and tomato diseases.
No. 106. The Chinch bug; experiments with insecticides.
No. 107. The Hessian fly.
No. 108. Bovine tuberculosis.
No. 109. Annual report for 1898-9.
No. 110. The maintenance of fertility.
No. 111. Investigations of plant diseases.
No. 112. The Clover Root Borer.
No. 113. Plums, comparison of varieties.
No. 114. How insects are studied at the Ohio Agricultural Experiment Station.
No. 115. Sugar beets and sorghum: Investigations in 1899.

This page intentionally blank.